

CLAIMS

I claim:

1. An apparatus for encapsulating semiconductor dies by stencil printing comprising:

5 a pressurized vessel for containing liquid encapsulating material therein; and a stencil printing head for riding over a stencil, said head comprising a slot in fluid communication with said vessel for allowing said encapsulating material to escape from said vessel under pressure; wherein said slot is angularly adjustable.

10 2. The apparatus of claim 1 wherein said stencil printing head is angularly adjustable over a 45 degree range.

15 3. The apparatus of claim 2 wherein said apparatus is adapted to hold a stencil and die assembly comprising a plurality of dies arranged in a pattern defining a first set of parallel streets and a second set of parallel streets, said first and second sets of parallel streets orthogonal to each other and wherein said 45 degree angular range spans from 5 degrees to 50 degrees from a direction parallel to one of said sets of parallel streets.

4. The apparatus of claim 3 wherein said angular orientation of said slot to said one of said sets of parallel streets is set to 15 degrees.

5. The apparatus of claim 3 wherein said angular orientation of said slot to said one of said sets of parallel streets is set to 45 degrees.

5 6. The apparatus of claim 3 wherein said slot has a length that spans a length of a stencil.

7. The apparatus of claim 6 wherein said slot has a width less than a width of said die.

10 8. The apparatus of claim 6 further comprising first and second squeegees positioned on opposite sides of said length of said slot.

9. A method of encapsulating devices, said method comprising the steps of:  
(1) providing an assembly comprising a stencil with at least one aperture surrounding at least one die, said aperture and die defining at least first and second streets, each street comprising space between said die and an edge of said aperture, 15 said first and second streets substantially orthogonal to each other.  
(2) placing liquid encapsulating material under pressure;

(3) providing a slot that provides fluid communication between said pressurized liquid encapsulating material and said assembly through which said liquid encapsulating material can be made to flow into said aperture and enclose said die;

5 (4) orienting said slot so that it is at an angle greater than 3 degrees relative to both said first and second streets; and

(5) forcing said liquid encapsulating material into said aperture through said slot via said pressure as said slot traverses said stencil, whereby said liquid encapsulating material enters said streets.

10. The method of claim 9 wherein said devices are semiconductor dies.

10 11. The method of claim 10 wherein said angle is between 5 and 50 degrees relative to said first street.

12. The method of claim 11 wherein said angle is 15 degrees relative to said first street.

15 13. The method of claim 11 wherein said angle is 45 degrees relative to said first street.

14. The method of claim 11 wherein said die comprises a plurality of dies arranged in a pattern whereas said first street comprises a plurality of streets and said second street comprises a plurality of streets.

15. The method of claim 14 wherein said aperture comprises a plurality of 5 said apertures, each surrounding a plurality of dies.

16. The method of claim 11 wherein step (3) further comprises providing first and second squeegees on opposite sides of said slot, respectively.

17. The method of claim 9 wherein step (5) comprises traversing all of said stencil with said slot at least once each in opposite directions.

10 18. The method of claim 9 further comprising the step of:  
(6) curing said encapsulating material after step (5).